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(54) **APPARATUS AND METHOD FOR REMOVING TOPS OR ROOTS FROM CROPS**

VORRICHTUNG UND VERFAHREN UM KÖPFE ODER WURZEL ABZUTRENNEN

APPAREIL ET PROCÉDE PERMETTANT DE RETIRER FEUILLES ET PETIOLES ET RACINES DE
PLANTES CULTIVÉES

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DescriptionTECHNICAL FIELD

[0001] This invention relates to apparatus and methods for removing tops or roots from crops such as radishes.

BACKGROUND ART

[0002] Many purchasers demand that root crops be supplied with little or no tops or roots. In the distant past they were removed by hand using a blade. As will be explained hereinafter it is proving necessary to use this method again to meet the demands of some purchasers.

[0003] Mechanised crop toppers have been devised. They typically comprise a plurality of contra-rotating rollers with a small gap. At least some of the rollers have an upstanding helical bead or scroll formed on them. A very narrow gap extends between the tip of the bead and an adjacent roller. Material to be removed, for example, tops and roots are caught in this small gap or 'nip' and torn off. Unfortunately, especially if one wishes to crop the top or root close to the product, damage can ensue. For this reason some purchasers such as major supermarkets insist on manual removal of tops.

[0004] GB 2 313 284 (Richard Pearson Ltd) describes an agricultural separating device comprising a plurality of counter-rotating members. The counter rotating members comprise resiliently deformable starwheels.

[0005] GB 2 215 972 (N.A. Garford) describes a crop cleaning device comprising a plurality of counter-rotating spaced apart shafts. The shafts are provided with scrolls or flights.

[0006] JP 67 026 960 (Asahi Kasei Kogyo KK) describes a reinforced plastics pipe of twisted polygonal shape.

[0007] The invention seeks to overcome or reduce the problems associated with the prior art.

DISCLOSURE OF THE INVENTION

[0008] According to the invention there is provided a machine for removing roots and tops from crops the machine comprising a pair of counter-rotating rollers spaced apart so as to define a nip there between, and means for rotating the rollers characterised in that at least one roller is in the form of a polygonal twisted prism.

[0009] According to the invention there is provided a roller for a machine for removing the tops and roots of crops between the nips of a pair of counter-rotating rollers, the roller being in the form of a polygonal twisted prism.

[0010] According to the invention there is provided a method for removing the tops and roots of crops the method comprising:

providing at least one pair of counter-rotating rollers spaced apart so as to define a nip therebetween, and introducing the roots or tops to the nip wherein at least one roller is in the form of a polygonal twisted prism.

[0011] It has unexpectedly been found that very good topping action can be obtained by twisting bar material. It is thought that the good results are a function of three features. First the bar corners are relatively sharp and provide a degree of cutting rather than the tearing action of the prior art rollers. Secondly there is a front clearance between the working edge and the body of the bar. This front clearance is almost absent in a cylindrical bar provided with a bead. The front clearance especially in a three or four sided bar is enhanced because bending the bar deforms the cross-section. In cross-section the initial planar faces of the bar become concave.

[0012] Thirdly the bar has, in effect, a multi-start helix. **[0013]** The features allow more efficient removal of tops and roots. This allows the rotational speed of the rollers to be reduced by a factor of around 3 to 6 times while still allowing the same throughput. The reduction in rotational speed substantially reduces the probability of damage to the crop.

BRIEF DESCRIPTION OF FIGURES

[0014] Embodiments of the invention will be illustrated by reference to the accompanying figures of which :

Fig. 1 is a plan view of a prior art arrangement;
Fig. 2 is a plan view of a crop topper of the invention
Fig. 3 is a cross-section of a roller of the invention;
and
Fig. 4 is a plan view of a machine of the invention.

MODES FOR CARRYING OUT THE INVENTION

[0015] Figs. 1 and 1A which are of the prior art shows a plain roller 1 and a counter rotating scrolled roller 2 with scroll 3. Crop 4 has a top 5. It will be seen that it is difficult to arrange for a small crop such as radish to be closely cropped.

[0016] By using the invention with for example a square bar 2a it will be apparent from Fig. 2 and Fig. 3 that a crop can be closely cropped and that this is aided by the concave faces of the bar.

[0017] As previously stated if the roller can conveniently be made by twisting a bar. It is not essential to do this and the skilled will have little difficulty in making rollers in other ways examples including CAM and spiral milling. The recessed face, while desirable is not essential for the performance of the invention as can be seen from Fig. 2.

[0018] The roller conveniently has four faces but this is not essential. Preferably the roller has three to six fac-

ets more especially the bar has four or six facets. Hexagon bar is readily available in many sizes, heptagon bar can be used is but less readily available and octagon bar which can also be used has limited availability. Larger numbers of facets have limited front clearance α and hence a greater degree of concavity may be required. Pentagonal bar is not readily available and hence must be specially prepared or machined.

[0019] The invention can be retrofitted to existing machines by replacing or machining rollers or new machines can be constructed.

[0020] A typical machine is shown in Fig. 4. Bed 10 is provided with an array of rollers 11, 12. Rollers are provided with drive means 13 which as illustrated comprises individual electrical or hydraulic motors. A single drive such as a gear chain or chain or belt drive could however be employed. Adjusters 14 may be provided to allow adjustment of the roller spacing. At least some of the rollers will be capable of counter-rotating. At least one of the rollers will be faceted as herein before described. As illustrated the apparatus is provided with a plurality of plain rollers and rollers of the invention. They can alternate but this is not essential and as illustrated they may be arranged in groups.

[0021] In some embodiments of the invention the rollers are provided in a planar array. In some embodiments of the invention the planar array may be inclined to the horizontal to facilitate passage of product across the array. Means for varying the inclination of the array and hence the residence time of product may be provided.

[0022] In some embodiments of the invention, including those where an inclined array is provided one or more rollers may stand out of the plane either above or below the plane. This can be helpful in providing suitable residence times. In some of these embodiment the displacement away from the plane may be adjustable to allow for regulation of residence times.

[0023] The twist of the rollers may all be of the same hand or some may be of one hand and some of the other. Some rollers may have portions of each hand.

Claims

1. A machine for removing roots and tops from crops the machine comprising a pair of counter-rotating rollers spaced apart so as to define a nip there between, and means for rotating the rollers **characterised in that** at least one roller is in the form of a polygonal twisted prism.
2. A machine according to claim 1 wherein the polygonal twisted prism has three to six facets.
3. A machine according to claim 2 wherein the polygonal twisted prism has four facets.
4. A machine according to claim 1 wherein the poly-

gonal twisted prism contains at least one full twist.

5. A roller for a machine for removing the tops and roots of crops between the nips of a pair of counter-rotating rollers, the roller being in the form of a polygonal twisted prism.
6. A roller according to claim 5 having at least three facets.
7. A roller according to claim 6 having four facets.
8. A method for removing the tops and roots of crops the method comprising;
 - providing at least one pair of counter-rotating rollers spaced apart so as to define a nip therebetween, and
 - introducing the roots or tops to the nip wherein at least one roller is in the form of a polygonal twisted prism.
9. A method as claimed in claim 8 wherein the polygonal twisted prism has three to six facets.
10. A method as claimed in claim 9 wherein the polygonal twisted prism has four facets.
11. A method as claimed in claim 8 wherein the polygonal twisted prism contains at least one full twist.

Patentansprüche

1. Eine Maschine zum Entfernen von Wurzeln und Köpfen von Pflanzen, die Maschine umfasst ein Paar von entgegengesetzt rotierenden Walzen, die derart beabstandet zueinander sind, dass sie einen Walzenspalt zwischen sich bilden, und Mittel zum Rotieren der Walzen, **dadurch gekennzeichnet, dass** wenigstens eine der Walze die Form eines vieleckigen verdrehten Prismas aufweist.
2. Eine Maschine gemäß Anspruch 1, wobei das vieleckige verdrehte Prisma drei bis sechs Facetten aufweist.
3. Eine Maschine gemäß Anspruch 2, wobei das vieleckige verdrehte Prisma vier Facetten aufweist.
4. Eine Maschine gemäß Anspruch 1, wobei das vieleckige verdrehte Prisma wenigstens eine vollständige Verdrehung beinhaltet.
5. Eine Walze für eine Maschine zum Entfernen der Köpfe und Wurzeln von Pflanzen zwischen dem Walzenspalt eines Paares von entgegengesetzt rotierenden Walzen, die Walze weist die Form eines viel-

- eckigen verdrehten Prismas auf.
6. Eine Walze gemäß Anspruch 5, welche wenigstens drei Facetten aufweist. 5
7. Eine Walze gemäß Anspruch 6, welche vier Facetten aufweist.
8. Ein Verfahren zum Entfernen der Köpfe und Wurzeln von Pflanzen, das Verfahren umfasst: 10
 Das Vorsehen von wenigstens einem Paar von entgegengesetzt rotierenden Walzen, welche derart beabstandet zueinander sind, dass sie zwischen sich einen Walzenspalt ausbilden, und 15
 Das Einführen von Wurzeln oder Köpfen in den Walzenspalt, wobei wenigstens eine Walze die Form eines vieleckigen verdrehten Prismas aufweist. 20
9. Ein Verfahren, wie beansprucht in Anspruch 8, wobei das vieleckige verdrehte Prisma drei bis sechs Facetten aufweist.
10. Ein Verfahren, wie beansprucht in Anspruch 9, wobei das vieleckige verdrehte Prisma vier Facetten aufweist. 25
11. Ein Verfahren, wie beansprucht in Anspruch 8, wobei das vieleckige verdrehte Prisma wenigstens eine vollständige Verdrehung beinhaltet. 30

polygonaal vrillé.

6. Rouleau selon la revendication 5 comportant au moins trois facettes.
7. Rouleau selon la revendication 6 comportent quatre facettes.
8. Procédé pour retirer les racines et les têtes des produits récoltés, consistant à :
 fournir au moins une paire de rouleaux tournant en sens inverse espacés de façon à définir entre eux une emprise, et
 introduire les racines et les têtes dans l'emprise dans laquelle au moins un rouleau se présente sous la forme d'un prisme polygonaal vrillé.
9. Procédé selon la revendication 8 dans lequel le prisme polygonaal vrillé possède trois à six facettes.
10. Procédé selon la revendication 9 dans lequel le prisme polygonaal vrillé présente quatre facettes.
11. Procédé selon la revendication 8 dans lequel le prisme polygonaal vrillé contient au moins un tour complet.

Revendications 35

1. Machine pour retirer des produits récoltés les racines et les têtes, la machine comportant une paire de rouleaux tournant en sens inverse, espacés de façon à définir entre eux une emprise et des moyens servant à faire tourner les rouleaux, **caractérisée en ce qu'un** rouleau au moins se présente sous la forme d'un prisme polygonaal vrillé. 40
2. Machine selon la revendication 1 dans lequel le prisme polygonaal vrillé possède trois à six facettes. 45
3. Machine selon la revendication 2 dans laquelle le prisme polygonaal vrillé présente quatre facettes. 50
4. Machine selon la revendication 1 dans laquelle le prisme polygonaal vrillé contient au moins un tour complet.
5. Rouleau destiné à une machine servant à retirer les têtes et les racines des récoltes entre les emprises d'une paire de rouleaux tournant en sens inverse, le rouleau se présentant sous la forme d'un prisme 55

Fig.1.

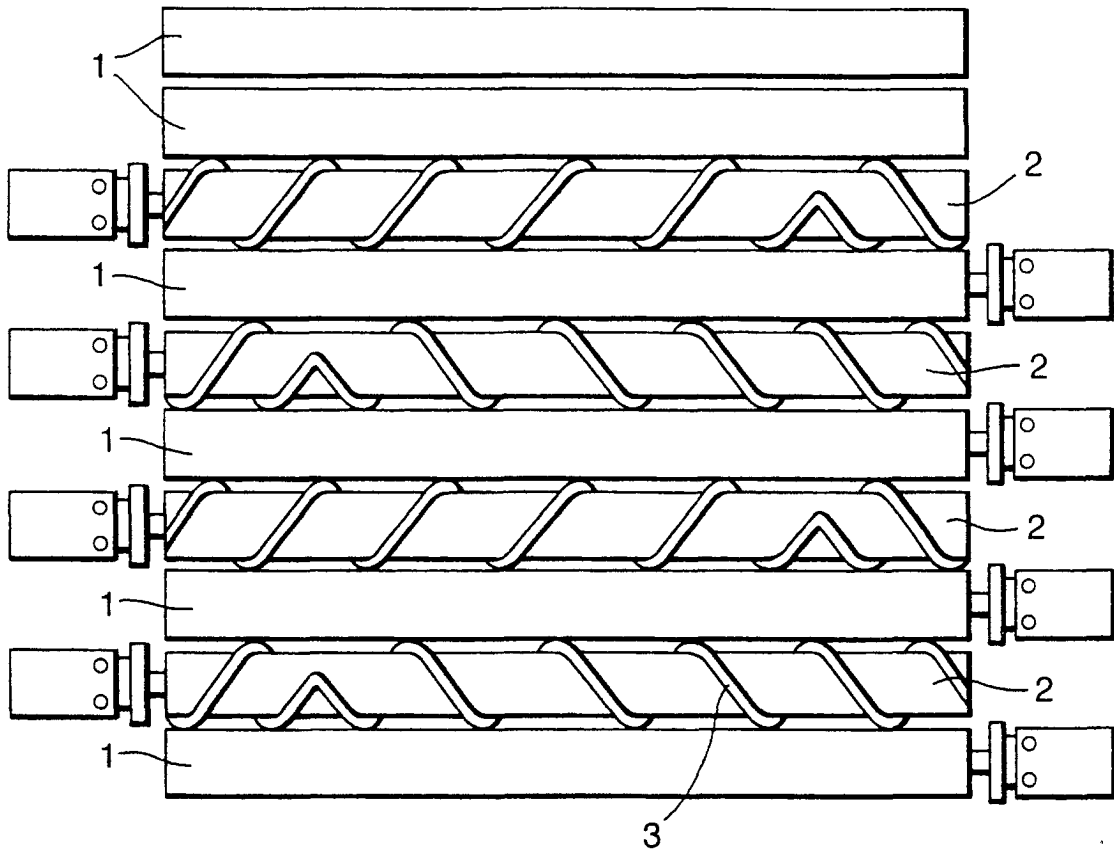


Fig.1a.

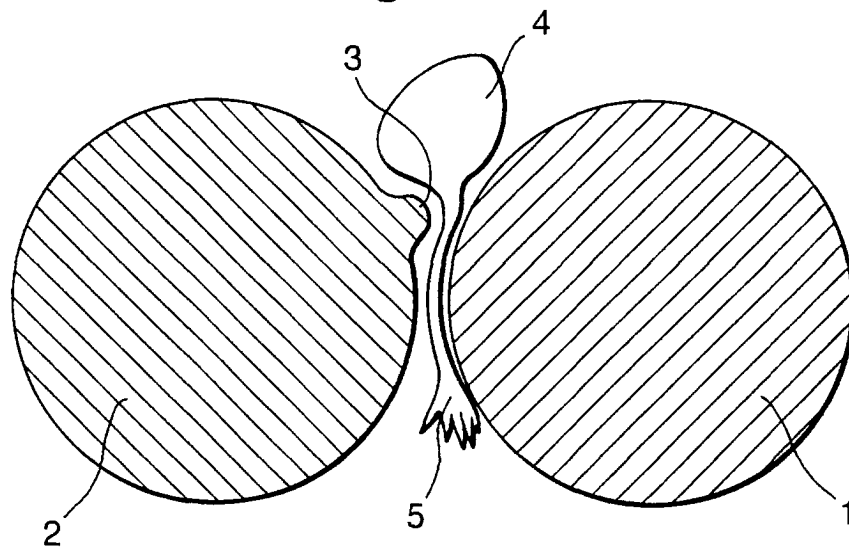


Fig.2.

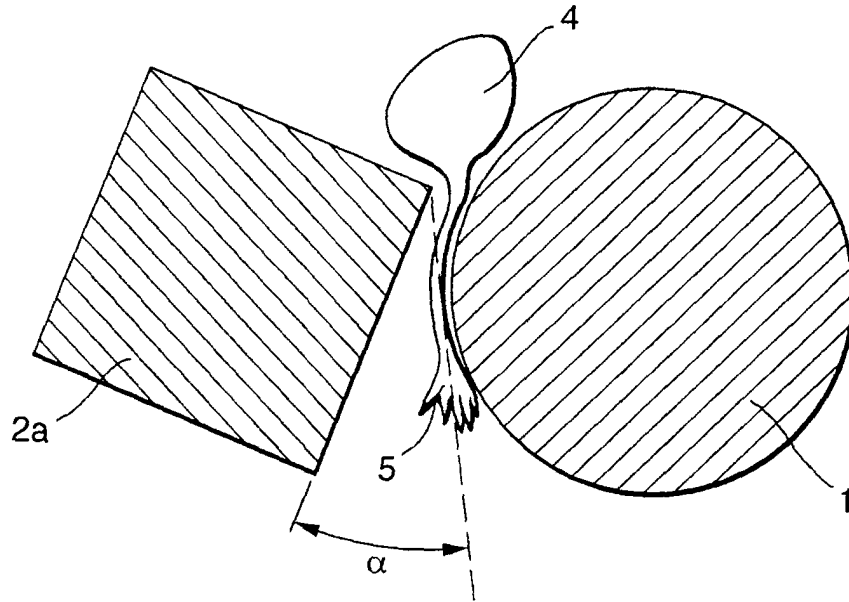


Fig.3.

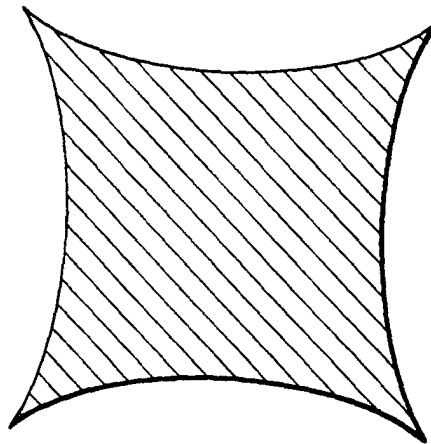


Fig.4.

